REMARKS

Claims 1-22 were pending in this application.

Claims 1, 2, 4, 5, 7-9, 11, 14-16, 18, 21, and 22 have been rejected.

Claims 3, 6, 10, 12, 13, 17, 19, and 20 have been objected to.

No claims have been amended.

Claims 1-22 remain pending in this application.

Reconsideration and full allowance of Claims 1-22 are respectfully requested.

I. ALLOWABLE CLAIMS

The Applicants thank the Examiner for the indication that Claims 3, 6, 10, 12, 13, 17, 19, and 20 would be allowable if rewritten in independent form to incorporate the elements of their respective base claims and any intervening claims. Because the Applicants believe that the remaining claims in this application are allowable, the Applicants have not rewritten Claims 3, 6, 10, 12, 13, 17, 19, and 20 in independent form.

II. REJECTION UNDER 35 U.S.C. § 102

The Office Action rejects Claims 1, 2, 4, 5, 7-9, 11, 14-16, and 18 under 35 U.S.C. § 102(a) as being anticipated by Wanlu et al., "Applying Multiresolution Analysis for Processing of Hydraulic Pump Fault Signal" ("*Wanlu*"). The Office Action rejects Claims 21 and 22 under 35 U.S.C. § 102(b) as being anticipated by He et al., "WPT-SVMs Based Approach for Fault Detection of Valves in Reciprocating Pumps" ("*He*"). These rejections are respectfully

traversed.

A prior art reference anticipates the claimed invention under 35 U.S.C. § 102 only if every element of a claimed invention is identically shown in that single reference, arranged as they are in the claims. (*MPEP § 2131; In re Bond, 910 F.2d 831, 832, 15 U.S.P.Q.2d 1566, 1567 (Fed. Cir. 1990)*). Anticipation is only shown where each and every limitation of the claimed invention is found in a single prior art reference. (*MPEP § 2131; In re Donohue, 766 F.2d 531, 534, 226 U.S.P.Q. 619, 621 (Fed. Cir. 1985)*).

Regarding Claims 1, 8, and 15, *Wanlu* recites a technique for identifying faults in hydraulic pumps. (*Page 1, Left column, Second paragraph*). The technique involves performing noise elimination using a wavelet transform. (*Page 1, Right column, Last paragraph*). As shown in Figure 1 of *Wanlu*, wavelet decomposition is performed on a monitored signal "s" to produce multiple decomposition layers "d1"-"d3" and "a3", and noise is reduced by smoothing each decomposition layer. (*Page 3, Right column, Last paragraph*). After that, the smoothed decomposition layers are used to reconstruct a signal "s1". (*Page 3, Right column, Last paragraph – Page 4, Left column, First paragraph*). As shown in Figure 2 of *Wanlu*, the reconstructed signal is then decomposed again into multiple decomposition layers "d1"-"d10" and "a10". (*Page 4, Left column, Last paragraph – Page 4, Right column, First paragraph*). One or more of the decomposition layers identifies faults in a hydraulic pump being monitored. (*Page 4, Right column, Last paragraph – Page 5, Second paragraph*).

Wanlu simply recites a technique where a monitored signal is decomposed and then reconstructed to reduce noise. The reconstructed signal is then decomposed again, and each

individual decomposition layer may identify faults in a pump being monitored.

Wanlu lacks any mention of grouping decomposition layers into multiple groups and then identifying defect indicators using the multiple groups. For example, *Wanlu* lacks any mention of grouping any of the decomposition layers "d1" through "d10" in Figure 2 into a group and then using the group to identify defect indicators. Rather, *Wanlu* simply uses each individual decomposition layer in Figure 2 to identify fault characteristics without grouping the decomposition layers in Figure 2.

Wanlu does recite that the decomposition layers "d1" through "d3" in Figure 1 are used to reconstruct a signal "s1". However, *Wanlu* lacks any mention of grouping the decomposition layers "d1" through "d3" in Figure 1 into multiple groups.

For these reasons, *Wanlu* fails to anticipate grouping a "plurality of resolution levels" into a "plurality of groups" and identifying "one or more defect indicators ... using the [plurality of] groups" as recited in Claims 1, 8, and 15. As a result, *Wanlu* fails to anticipate the Applicants' invention as recited in Claims 1, 8, and 15 (and their dependent claims).

Regarding Claim 21, *He* recites a technique to identify faults with valves in three-cylinder reciprocating pumps. (*Page 4566, Left column, Abstract*). *He* uses a wavelet packet transform to pre-process a vibration signal and a support vector machines-based classifier to classify different types of valve faults. (*Page 4567, Left column, Second paragraph*). In particular, the wavelet packet transform decomposes a vibration signal into multiple levels, where each level has multiple coefficient vectors. (*Page 4567, Right column, First paragraph*). The root mean square value of each coefficient vector is then calculated. (*Page 4569, Left*

column, First paragraph). The root mean square values for all of the coefficient vectors are then used to construct a feature vector, and the feature vector is provided to the classifier for analysis. (*Page 4569, Left column, First paragraph – Page 4569, Right column, First paragraph*).

He simply recites a system where a monitored vibration signal is decomposed into coefficient vectors on multiple levels, and all of the coefficient vectors on all of the levels are used to produce a feature vector. The feature vector is then analyzed by the classifier.

He lacks any mention of grouping the different levels of coefficient vectors into multiple groups and then identifying defect indicators using the multiple groups. For example, *He* lacks any mention of producing multiple feature vectors using the multiple levels of coefficient vectors for a single valve. Rather, *He* generates a single feature vector for each valve using all of the coefficient vectors on all of the different levels for that valve.

He does recite generating multiple feature vectors. However, each feature vector is generated using a different signal from a different valve sensor. (*Page 4569, Left column, Last paragraph*). *He* never groups coefficient vectors from multiple levels into multiple groups for a single signal.

For these reasons, *He* fails to anticipate decomposing a single signal into a "plurality of resolution levels," grouping the resolution levels into a "plurality of groups," and identifying "one or more defect indicators ... using the [plurality of] groups" as recited in Claim 21. As a result, *He* fails to anticipate the Applicants' invention as recited in Claim 21 (and its dependent claim).

Accordingly, the Applicants respectfully request withdrawal of the § 102 rejections and

full allowance of Claims 1, 2, 4, 5, 7-9, 11, 14-16, 18, 21, and 22.

III. CONCLUSION

The Applicants respectfully assert that all pending claims in this application are in condition for allowance and respectfully request full allowance of the claims.

SUMMARY

If any issues arise, or if the Examiner has any suggestions for expediting allowance of this application, the Applicants respectfully invite the Examiner to contact the undersigned at the telephone number indicated below or at *wmunck@davismunck.com*.

The Commissioner is hereby authorized to charge any additional fees connected with this communication (including any extension of time fees) or credit any overpayment to Deposit Account No. 50-0208.

Respectfully submitted,

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